

## **REMARKS**

Reconsideration of the application is respectfully requested for the following reasons:

### **Allowable Subject Matter**

Claims 11-18 are allowed.

Claims 5-7 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Applicant respectfully emphasizes that claims 5-7 should not be objected to since the corresponding independent claim 1 is patentable as discussed below.

However, applicant rewrites claim 7 as a new independent claim 27 to include all of the limitations of the base claim.

### **Amendment to Claims**

Original Claims 1, 4 and 19 are amended and new claims 20-18 are added.

Moreover, all amendments are at least supported by the following portions of the original specification and the original drawing: page 6 line 28 to page 7 line 6, page 8 lines 6-10m page 9 lines 20-26, page 10 line 26 to page 11 line 18, FIGs, 1B-1C, FIGs, 2B-2C, and FIGs. 3C-3E.

No new matter is added.

**Rejection of Claim 4 Under 35 U.S.C. §112(2)**

Claim 4 is rejected under 35 U.S.C. 112(a), as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

The Examiner considers that there is insufficient antecedent basis for the limitation “ said high pressure solution” cited by claim 4 in lines 2-3.

Applicant agrees that there is insufficient antecedent basis for claim 4. Applicant amends claim 4 by deleting “high pressure”.

Accordingly, the rejection under 35 U.S.C. 112(2) is traversed.

**Rejection of Claims 1-4, 8-10 and 19 Under 35 U.S.C. §103(a)**

Claims 1-4, 8-10 and 19 are rejected under 35 U.S.C. §103(a) as being unpatentable over Erk et al. (Hereinafter Erk)(U.S. Patent No. 5,340,437).

By referring to Fig. 1, col. 3 lines 20-30, col. 4 line 1, col. 8 lines 5-12 and col. 8 lines 60-61 of Erk, the Examiner considers that the claimed method does not define over Erk.

The Applicants respectfully traverses this rejection.

The Applicants’s reasons are briefly summarized as follows: the differences between the claimed methods and Erk are more than what the Examiner considers.

Initially, applicant emphasizes that the claimed invention is related to the problem that a rough surface on a material used for semiconductor fabrication cannot be economically and effectively formed by the prior art.

Applicant emphasizes that the essential idea of the claimed invention is covering portions of a surface by numerous bubbles, such that the etching solution only etches portions of the surface but does not etch the entire surface. Hence, the distribution of the removal quantity is non-uniform and a rough surface is then formed.

Applicant briefly summarizes the main character of the claimed invention as follows: treat a surface by an etching solution with bubbles. Moreover, the claimed invention is not characterized by the following: When to form bubbles in solution? How to form bubbles in solution? Should the bubbles be formed in the solution before the substrate is immersed?

Applicant further emphasizes the following limitation: bubbles are used to prevent a partial surface from being etched and thereby form a rough surface by inducing a non-uniform distribution of the removal amount over the whole surface. Therefore, each bubble must stay at a specific portion on the surface during a sufficient period such that the removal amount of the non-covered partial substrate is significantly different than the removal amount of the covered partial substrate. In other words, there is no relative motion between the bubbles and the substrate when the partial substrate is being etched.

Otherwise, while the location of each bubble on the surface is not essentially fixed during the period the substrate is immersed, different portions of the surface have the same probability to be etched and then different removal amounts among different portions would be small or even zero, which means a rough surface cannot be formed.

Please at least refer to the following portions of both the original specification and the original drawing: page 3 line 24 to page 4 line 26, col. 6 line 5 to page 7 line 6, page 7 lines 13-26, page 8 lines 6-21, page 9 lines 20-26, page 10 line 26 to page 11 line 18, FIGs, 1B-1C, FIGs, 2B-2C, and FIGs. 3C-3E.

Applicant emphasizes that the differences between Erk and the claimed invention are more than what the Examiner considered.

By at least referring to the following portions of Erk: Fig. 1, col. 2 lines 13-36, col. 3 lines 4-12, col. 3 lines 20-20, col. 4 line 1, col. 8 lines 5-12, col. 8 lines 13-22 and col8 lines 60-61, applicant briefly summarizes Erk as follows: Erk not only treats a surface of a substrate by a solution (froth) with bubbles, but also rotates the substrate and flows the solution through the surface at the same time while the surface is treated by the solution with bubbles. Therefore, a surface with a relative low surface microroughness value than the surface formed by the conventional technology is formed, and some defects such as the rigid-body effect can be properly prevented.

Significantly, as shown in Erk's claims, Erk's method must rotate the substrate while the solution with bubbles flows through the surface

of the substrate. This means that there is a relative motion between the solution and the substrate while the surface layer is immersed in the solution. Moreover, Erk uses this to let the effect of bubbles be uniform over the whole surface and to form a less rough surface than the conventional technology.

In contrast, as discussed above, although the original specifications never word by word recites the limitation that no relative motion between the solution and the substrate occurs while the surface layer is immersed in the solution, the claimed invention really recites this as an inherent limitation.

Therefore, it is significant that whether a relative motion is existent or not, this is an indisputable difference between the claimed invention and Erk.

Moreover, Erk acquires a less rough surface by using the relative motion, but the claimed invention acquires a rough surface by keeping the relative relation between the solution and the substrate fixed. In this way, this indisputable difference really induces significant results and then the non-obvious character of the claimed invention is indisputable.

Furthermore, Erk's purpose conflicts with the purpose of the claimed invention. The purpose of Erk is to form a plane surface that has a smaller microroughness, but the purpose of the claimed invention is to form a rough surface. Thus, when one skilled in the art attempts to practice the purpose of the claimed invention, it is natural

to refer only to any prior art that is related to formation of a rough surface, but it is improper to refer Erk that is related to reducing the microroughness of a surface.

Besides, because the step of rotating the substrate is a key of Erk's method, applicant considers that the Examiner's viewpoint of Erk is strongly improper for the key step is ignored by the Examiner.

Particularly, applicant emphasizes that the word "immerse" only means "to put deep into a body of liquid", by LONGMAN DICTIONARY OF CONTEMPORARY ENGLISH, ISBN 962-359-273-6. Thus, applicant further emphasizes that the Examiner cannot expand the scope of the originally present claims to include a step of rotating substrate, especially the whole original specification never discloses or teaches the claimed method has the step of "rotating the substrate".

Further, applicant emphasizes that page 2 lines 10-15 discloses prior art, US 6169038, which rotates a substrate and etches the substrate at the same time but has the disadvantage such as difficulty to control and the amount of etching solution used is huge. Hence, applicant emphasizes again that the patentability of the claimed invention should not be denied by any prior art that rotates and etches a substrate simultaneously.

Furthermore, applicant agrees that Erk's col. 8 lines 60-61 really discloses that the etched wafer has some roughness. However, col. 8 line 50 to col. 9 line 21 are only two examples of Erk. By comparing with col. 1 lines 34-56, which shows some data about the available

minimized microroughness of prior art, and by referring to col. 2 lines 13-30, which briefly states the objects of Erk, applicant reasonably emphasizes that Erk's col. 8 lines 60-61 clearly only indicates the microroughness of treated surface being effectively reduced by Erk's method. In other words, Erk's col. 8 lines 60-61 does not indicate Erk presents a method for forming a rough surface. Otherwise, the "background of the invention" of Erk can form a rougher surface and then there is no significance of Erk's method.

Finally, to clearly emphasize the previous difference, some of the pending claims are rewritten to directly express that "substrate in a solution contained with a tank" and "wherein said bubbles stay on said substrate due to no relative motion between said tank and said substrate exists". Herein, a solution contained with a tank is natural and obvious for well-known technology, and no relative motion between the tank and substrate indisputably implies that the bubbles must be fixed on the substrate for no mechanism lets the solution flow. Moreover, because the claimed invention is not concerned about whether bubbles are formed in the solution before the substrate is immersed, the contents of various original dependent claims are added to both claim 1 and claim 19.

According to the above, applicant emphasizes that the present invention cannot be acquired only by referring to Erk. Therefore, original claims 1-4, 8-10 and 19 are patentable.

In summary, all rejections under 35 U.S.C. 103(a) are traversed. Therefore, reconsideration and withdrawal of the Examiner's rejection under 35 U.S.C. Section 103(a) is respectfully requested.

### **Conclusion**

In light of the above amendments and remarks, Applicant submits that all pending Claims patentably distinguish over all cited prior art and are now in condition for allowance. Accordingly, reconsideration of the present application and withdrawal of the rejections are respectfully requested.

Attached hereto is a marked-up version of the changes made to the specification and claims by current amendment. The attached page is captioned "**Version with marking to show changes made.**"

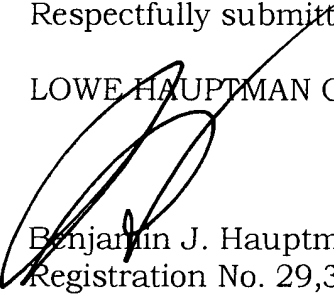
To the extent necessary, a petition for an extension of time under 37 C.F.R. 1.136 is hereby made. Please charge any shortage in fees due in connection with the filing of this paper, including extension of time fees,



to Deposit Account 07-1337 and please credit any excess fees to such deposit account.

Respectfully submitted,

LOWE HAUPTMAN GILMAN & BERNER, LLP



Benjamin J. Hauptman  
Registration No. 29,310

1700 Diagonal Road, Suite 310  
Alexandria, Virginia 22314  
Telephone: (703) 684-1111  
Facsimile: (703) 518-5499  
Date: January 3, 2003

## **VERSION WITH MARKING TO SHOW CHANGES MADE**

### **IN THE CLAIMS:**

Claims 1, 4 and 19 have been amended as follows.

1. (Amended) A method for forming a rough surface, comprising:  
providing a substrate;

immersing a surface layer of said substrate in a solution  
contained within a tank, said solution being able to remove said  
surface layer;

forming a plurality of bubbles in said solution, wherein part of  
said bubbles are located on a surface of said surface layer, [said  
surface being contacted with said solution] and wherein said bubbles  
stay on said substrate due to no relative motion between said tank and  
said substrate exists; and

removing said solution.

4. (Amended) The method of claim 1, further comprises putting  
said substrate in a reactor and immersing said substrate by said [high  
pressure] solution, and then keep normal pressure of said reactor such  
that said bubbles are formed in said solution.

19. (Amended) A method for forming a rough surface, comprising:

providing a substrate;

forming a plurality of bubbles in a solution, said solution being able to remove said surface layer;

immersing a surface layer of said substrate in said solution contained with a tank, wherein part of said bubbles are located on a surface of said surface layer, [said surface being contacted with said solution,] wherein said bubbles stay on said substrate due to no relative motion between said tank and said substrate exists; and removing said solution.

Claims 20-28 have been added as follows.

20. (Added) The method of claim 19, further comprises putting said solution in a reactor and reducing the pressure of said reactor such that said bubbles are formed in said solution before said substrate being immersed.

21. (Added) The method of claim 19, further comprises putting said substrate in a reactor and conveying a gas into said reactor such that said bubbles are formed in said solution before said substrate being immersed.

providing a substrate, said substrate having a surface layer;  
covering part of said surface layer by a photoresist;  
immersing said surface layer and said photoresist in a solution  
contained with a tank, said solution being able to remove said surface  
layer;  
forming a plurality of bubbles in said solution, wherein part of  
said bubbles are located on a surface of said surface layer, and  
wherein said bubbles stay in said substrate due to no relative motion  
between said tank and said substrate exists; and  
removing said solution.

28. (Added) The method of claim 27, no relative motion between  
said solution and said substrate being existent after said surface layer  
being immersed.



Creation date: 08-22-2003  
Indexing Officer: PTANG - PHUONG-THAO TANG  
Team: OIPEBackFileIndexing  
Dossier: 09824855

Legal Date: 01-15-2003

No.	Doccode	Number of pages
1	SRNT	2

Total number of pages: 2

Remarks:

Order of re-scan issued on .....